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MEMORANDUM FOR THE FILE

Trip Report, Washington, D. C. to AS-6 Installation

I left Washington, D. C. by air on 29 July 1959, and reported to Chief, on the morning of the 30th, After a discussion about the installation and shipping problems involving the AS-6 equipment, I left to report to

The following day at was taken up discussing the installation of the AS-6 equipment at (the receiver site and transmitter site respectively) i.e., the equipment layout, wiring, microwave changes, power requirements, antennas, multicouplers, etc.

Upon arrival at the receiver site was just receiving new flooring in the form of asphalt tile. The AS-6 equipment has been installed in this room, adjacent to the teletype room. The two new receiving rhombics were in the process of construction by the area engineer and his men. The reconstruction and change of bearing of the transmitter site rhombic for this project was not yet started, except for the new cement bases and anchors.

Saturday, 1 August, the AS-6 equipment had not yet arrived, so I helped the area engineer and his men in the fabrication of antenna guy cables, layout of towers and associated hardware.

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The AS-6 equipment arrived [] on Sunday, 2 August, by [] after some confusion of arrival reports and two unsuccessful trips by Supply in trucks.

[] there were no [] laborers to help in uncrating the equipment. Between the Supply people and myself, we uncrated the equipment and set the equipment aside in two groups; the receive terminal the the transmit terminal. The transmit terminal was sent to [] and the receive terminal was sent to the receiver site.

Monday afternoon and Tuesday were devoted to assembling, mounting, and interconnecting the four receiver terminal racks and equipment, and checking for physical damage.

Plug-in relays on some of the equipment chassis were shipped without hold-down tape and were loose. One relay was broken in the remote unit. This was ordered immediately from headquarters.

The power supply for RF cabinet #2 had been apparently dropped during shipment, the chassis was sprung and distorted, and the chassis bolts had been sheared. Later this power supply was found to function properly, however, and the bolts were replaced on the chassis.

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Two power supply meter cases were cracked or broken, and one running-time hour meter in the recorder "A" drawer had a broken case, but functioned well. One running time meter did not work and was replaced in RF cabinet #3.

The base station clock programmer was not included in the original shipment, since it had been delayed for the installation of the program tape.

The transmit terminal was set up at in place of HT⁴/G transmitter number 14 in the east wing alongside the 231D-20 transmitter number 13 that was to be modified for AS-6 operation. The installation was explained to the transmitter site personnel and advance work was started by the "T" site technician by revamping the HT⁴ terminal box for use with the AS-6. The same power wiring which had powered the HT⁴ was used for the AS-6 transmit terminal cabinet.

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The HT⁴ control cable from the main frame was used along with an additional new four pair lead covered cable for remote control of the AS-6 transmit terminal from the receiver site via Motorola microwave channels.

Station prints and terminal count sheets were checked to determine the most practical way to revise the microwave key lines for remote control of the AS-6 transmit terminal. After deciding this, and with approval by the area engineer and Operations, I made up a

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drawing together with terminal counts. This drawing was turned over to the "T" site technician [] who then made the wiring additions and changes at the main frame at [] from this data. Meanwhile I made up an additional drawing and turned this over to the wire maintenance technician at the receiver site, who wired into the main frame, after we ran the added 13 pair lead covered cable from the cypher room to the main frame in the operations room.

Four power cables were run to spare breakers in the power distribution box in the teletype room from the cypher room. They were wired to twistlock receptacles mounted behind the AS-6 cabinets on the floor together with the newly installed ducts.

[] arrived on Saturday, 8 August.

After the power wiring had been installed and the equipment turned on, [] and I checked over the equipment for any electrical faults. While [] made a more detailed check, I went ahead with coaxial cable runs (a total of six each RG-59/U) to the multicoupler patch panel in the operations room. Two multicouplers were used in conjunction with the two new rhombic antennas to accommodate six receivers in dual space diversity operation.

The receive terminal equipment was found to operate normally with the exception of a malfunction of some of the alarm circuit relays.

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A resistor in series with the coil of these relays was causing too great a voltage drop for proper operation of the relays. (These resistors were put into the various alarm circuits by to cause a slow-operate function).

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In order to get the equipment into operation as quickly as possible, it had been decided to use existing power wire on hand which was no. 14 wire. The idea was to correct this at a later date by installing no. 12 wire power cable. (The area engineer is aware of this and intends to make this change).

As a consequence, the voltage drop in each of the four power cables was about 4 volts. (Using no. 14 wire and drawing 12.5 amps per cable).

The relay condition was corrected by changing the tap on the transformer for the +280dc power supply in the control drawer.'

The microwave key lines were changed and rewired for AS-6 remote operation. AFC key lines CW 7, 8, 9, and 10 were used to send to and AFC CW 57, CW 58, TTY 9 and TTY 10 circuits were used for verification circuits coming back from . The last four Audio Frequency Carrier equipment mentioned were interchanged between transmitter and receiver sites. The four AFC transmitters were removed from the receiver site, and the four corresponding channels were removed from the transmitter site and brought over to the "R" site. The reason for this was that only two AFC transmitters were at the "T" site for order printer circuits between sites.

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These circuits were wired in such a way that the same Subcarrier equipment was used on the microwave system. The same procedure for changing to landline is still valid.

[] and I went to [] on Friday 14 August to check over the transmitter terminal and to begin modifications of the [] 231D-20 transmitter no. 13. The remote control function had not been completely checked out by [] prior to shipment, and there were mistakes in the remote wiring features within the transmit terminal and the remote unit. These mistakes were traced and corrected by [] and myself. In scooping the various waveforms within the transmit terminal it was found that the verification phase detector was not operating properly due to shorted turns in the phase detector transformer. [] replaced the RF transformer only to discover that the gain of the circuit was now too great. This caused clipping in the following amplifier circuits. [] modified the circuit by removing one amplifier from the circuit. (One half of a dual triode).

After the 231D-20 modifications and necessary wiring were completed, the 231D-20 was tuned on all 10 channels. In the process of tuning, we discovered that the AS-6 exciter was not mixing properly on some channels, therefore they had to be retuned. Later, when we brought a H. P. frequency counter over to [] we discovered it was impossible to get an accurate count due to stray RF from other transmitters in the building which were up on RTTY circuits.

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We removed the exciter drawer from the transmit terminal and took it to [] where we were able to obtain a correct frequency measurement and also completely retuned all channels to prevent improper mixing within the drawer. When the field equipment arrived we verified our suspicions that channel 3 crystal frequency in the base station transmit terminal was in error. This crystal must be replaced, and channel 3 should be completely retuned.

The base station clock programmer arrived before [] [] Headquarters engineer, and the field terminal. Upon inspection we learned that the block within the programmer, which is used to keep the clock stopped and ready to be started, was not set in position and the clock had run down. (This may have been caused by a jar in shipment or by an oversight before shipment). [] and I decided not to install the programmer in the base station receive terminal before the field equipment arrived to prevent the tape from being prematurely advanced.

[] brought the field equipment to [] on September 9th. The field equipment was set up a few miles from the "R" site and individual channels were triggered and received by us.

The field equipment was brought back to the "R" site and we found that the programmer did not start. The unit was disassembled and the clock started. RF feedback was found to be a problem in the field equipment, so the field equipment was set up outside the "R" site and partially buried. Transmissions were then originated manually, but the short-range-timer did not function properly. The unit was again removed,

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and [] again dismantled the unit to determine the cause. It was discovered that one of the lines brought out of the unit for individual channel testing was shorting to the case.

The following day, 10 September, we tested all channels of the field unit against the base station receive terminal, and remotely controlled the transmit terminal to operate the field on both interrogate and receipt functions. Channel 3 from the base transmit terminal was off-frequency and did not operate the field unit.

After local testing was completed, the clock programmers of both the field and base were set to exactly the same time and the program tapes were advanced to correspond to the exact hour. The field station battery supply was then recharged, and the complete field unit was repacked for shipment.

Two weeks prior to [] the base station installations were complete. [] and myself then set up a class of instruction on the equipment. During the first two days, the theory of operation and overall block diagrams were discussed. During this, [], area engineer, operators, and technicians attended (about 12 persons including []).

Thereafter a total of five technicians attended the lectures; these lectures concerning equipment theory and operation.

A total of approximately three weeks was devoted to the instruction and maintenance discussions. During this time we put troubles into

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the equipment for the technicians to analyze and correct. This helped them a great deal.

During the time between the departure of the field equipment and the final tests we gave the technicians an opportunity to gain-track the receivers and to make all adjustments of the terminal.

The tests, which were scheduled for 16 and 17 September [redacted] [redacted] were carried out using the new antennas. Twenty three messages were received from the field terminal during these two days. Only one of these was down in the noise level (it was on the LOWF for that time), but the recognition and sync. were received and were readable. All other messages were very clear and easy to read on the visicorder tape. The collector package was not used during these tests.

The two transmissions received [redacted] in August from the Washington area were very clear and no trouble was encountered in reading the message from the collector.

A modification was performed in recognition drawer on all three RF cabinets by [redacted]. This was done to insure a more positive and sensitive recognition even if the signal to noise ratio is 1 to 1 or less. There are supposed to be 105 volt zener diodes in this modification, but since these were not available, batteries were substituted. [redacted] will have these zener diodes shipped when he returns to [redacted] Leads from the batteries are wired into blank pins on a terminal board beneath the recognition drawer chassis, and will be a simple matter to install the zener diodes.

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The modification parts were received 17 September for the installation within the control drawer of the data cabinet. This addition, rather than a modification, is for the operation of the running time meter which is actuated by the operation of the 30 day test transmission period program and for the purpose of determining the time difference between base and field clocks. This modification will be installed by the receiver site technicians.

The day following the 17 September tests, [] left for [] while I spent the day going over the operation of the terminal with the assistant [] and the Chief operator.

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It is my opinion that the AS-6 equipment is very good from a technical as well as operational viewpoint. There was only one breakdown that could have caused trouble. This was the clutches¹ in the visicorders. These have both been replaced and rubber bushings were put in to ease any binding due to mal-alignment. [] said that this mechanical design would be revamped and the necessary parts would be shipped for modification.

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